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EXAMINER

ESHETE, ZELALEM

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EXAMINER

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Commissioner for Patents

This examiner answer corrects the inadvertent omission of the heading (11). It doesn't change the scope of the office action mailed on 6/20/2006.



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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

MAILED

Application Number: 10/602,938
Filing Date: June 24, 2003
Appellant(s): SLOANE ET AL.

FEB 01 2007
Group 3700

Christopher Eusebi
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal reply brief filed 08/21/2006.

This supplemental Examiner's Answer is in response to the reply brief submitted by appellant on 08/21/2006 in response to a previous supplemental Examiner's Answer that was mailed on 6/20/2006 correcting a remand by the Board. In this supplemental appeal brief, there were new issues raised which are addressed by the Examiner's Answer on page 11.

(1) *Real Party in Interest*

A statement identifying the real party in interest is contained in the brief.

(2) *Related Appeals and Interferences*

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) *Status of Claims*

The statement of the status of the claims contained in the brief is correct.

(4) *Status of Amendments After Final*

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) *Summary of Claimed Subject Matter*

The summary of claimed subject matter contained in the brief is correct.

(6) *Ground of Rejection to be Reviewed on Appeal*

The appellant's statement of the ground of rejection in the brief is correct. The dependent claims stand or fall on their dependence on the independent claims 1,13,27.

(7) *ClaimsAppealed*

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) *Prior Art of Record*

EP0643209	Dahung	03-1995
US4419969	Bundrick	12-1983
US4765293	Gonzalez	08-1988
US6314925	Britton	11-2001
US5832880	Dickey	11-1998
US5409784	Bromberg	04-1995
US4690743	Ethington	09-1987
US4965052	Lowther	10-1990

(9) *Grounds of Rejection*

The following ground(s) of rejection are applicable to the appealed claims:

1. Claims 1,2,8-14,17,20,24-28,34,35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dahung (EP 0643209) in view of Bundrick (4,419,969) and further in view of Gonzalez (4,765,293).

Regarding claims 1,12,13: Dahung discloses a method of operating a homogeneous-charge compression ignition (HCCI) engine, comprising: mixing air, and

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a plurality of fuel to form a combustion mixture; and compressing said combustion mixture, releasing energy and converting said combustion mixture to exhaust gas and exhausting the exhaust gas as is inherent in engines (see figure 1). Dahung further discloses high load condition and low load condition and controlling the supply of the plurality of fuels depending on the load condition.

Dahung fails to disclose one of the fuels is acetylene-based component and concurrent injection.

However, Bundrick teaches the use of acetylene in the compression ignition (see column 2, lines 15 to 18).

Gonzalez further teaches the pilot and main injections timings may be concurrent or staged depending application parameters (see column 2, line 67 to column 3, line 3).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Dahung by using acetylene as taught by Bundrick in order to utilize a wide variety of fuels available for the production of energy. It also would have been obvious to further employ an injection timing of staged or concurrent depending on application parameters as taught by Gonzalez in order to enhance the engine performance.

Regarding claim 27: Dahung as modified above discloses the claimed invention as recited above; and Dahung further discloses a vehicle driven by a homoneneous-charge compression ignition engine comprising: plurality of fuel supplies, a cylinder having a piston reciprocally driven therein, the cylinder receiving a combination mixture

of air, main fuel, and pilot fuel, wherein the piston compresses the combustion mixture to induce auto-ignition of the combustion mixture (see figure 1; abstract; column 1, lines 1 to 10).

Regarding claims 2,14,28: Bundrick discloses the fuel consists essentially of acetylene (see column 2, lines 15 to 18).

Regarding claims 8,24: Dickey discloses drawing the combustion mixture into a cylinder of the HCCI engine, in that he discloses the mixing prior to introducing into the combustion chamber (see column 8, lines 36 to 42).

Regarding claims 9,25: Dahung discloses mixing the combustion elements within the cylinder of the engine (see figure 1).

Regarding claims 10,11,26,34: Dahung in view of Bundrick discloses the claimed invention except for the claimed numerical values. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the claimed numerical values based on the application, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claim 17: Dahung as modified above discloses controlling a supply of the acetylene-based component comprises maintaining a consistent supply regardless of the load, in that he discloses supply of the main and pilot fuels at any load condition (see abstract).

Regarding claim 20: Dahung as modified above discloses controlling a mixture amount of the fuel comprises reducing the mixture amount as the load decreases, as it is inherent in engine performance to require higher fuel mixture at higher load and lower fuel mixture at lower load.

Regarding claim 35: Dahung as modified above discloses the amount of the acetylene-based component varies based on a load of the engine, in that both fuels are administered based on the load conditions (see column 8, lines 1 to 23).

2. Claims 3,15,29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dahung in view of Bundrick and further in view of Gonzalez and further in view of Britton (6,314,925).

Dahung in view of Bundrick and further in view of Gonzalez disclose the claimed invention except the use of hydrogen.

However, Britton teaches the hydrogen and acetylene exhibit higher flame speed (see column 8: lines 22 to 24).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Dahung in view of Bundrick, and further in view of Gonzalez's system by utilizing hydrogen as taught by Britton in order to improve the combustion process.

3. Claims 4,16,30,31,32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dahung in view of Bundrick and further in view of Gonzalez and further in view of Dickey (5,832,880).

Regarding claims 4,16,30: Dahung in view of Bundrick and further in view of Gonzalez disclose the claimed invention except the use of EGR.

However, Duckey teaches the use of EGR in compression ignition (see figure 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Dahung in view of Bundrick and further in view of Gonzalez's system by utilizing EGR in order to improve engine efficiency.

Regarding claim 31: Dickey discloses an inlet valve movable between an open position and a closed position, wherein when the open position the inlet valve enables a flow of the combustion mixture into the cylinder (see figure 1).

Regarding claim 32: Dahung as modified above discloses the claimed invention as recited above and further discloses a fuel injector for the main fuel and a fuel injector for a pilot fuel to inject specific amount of fuels at specific timing (see figure 1; abstract).

4. Claims 5,6,21,22,33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dahung in view of Bundrick and further in view of Gonzalez and further in view of Bromberg et al. (5,409,784).

Dahung in view of Bundrick and further in view of Gonzalez disclose the claimed invention; however, fails to disclose producing the acetylene-based component using a plasma generator that uses a voltage and a frequency.

However, Bromberg teaches using plasma generator to produce acetylene by using voltage and frequency (inherent) (see figure 11).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Dahung in view of Bundrick and further in view of Gonzalez's system by using a plasma generator to produce acetylene as taught by Bromberg in order to convert hydrocarbon fuels.

5. Claims 7,23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dahung in view of Bundrick and further in view of Gonzalez and further in view of Ethington et al. (4,690,743).

Dahung in view of Bundrick and further in view of Gonzalez disclose the claimed invention; however, fails to disclose producing the acetylene-based compound with a thermal reactor.

However, Ethington teaches producing acetylene using a reformer or a thermal reactor (see column 12, lines 29 to 39).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Dahung in view of Bundrick and further in view of Gonzalez's system by producing acetylene using a reformer as taught by Ethington as an alternative means of producing acetylene.

6. Claims 7,23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dahung in view of Bundrick and further in view of Gonzalez and further in view of Lowther et al. (4,965,052).

Dahung in view of Bundrick and further in view of Gonzalez disclose the claimed invention; however, fails to disclose producing the acetylene-based compound with a thermal reactor.

However, Lowther teaches producing acetylene using engine reactor (see column 2, lines 3 to 7).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Dahung in view of Bundrick and further in view of

Gonzalez's system by producing acetylene using an engine reactor as taught by Lowther as an alternative means of producing acetylene.

7. Claims 18,19,36 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

(10) Response to Argument

In response to appellant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

First, appellant attacks the Bundrick reference separately by neglecting why the reference is combined with the primary reference and the motivation to do so as discussed in the rejection. Appellant argues Bundrick fails to teach multiple fuels. However, the primary reference (Dahung) discloses the use of multiple fuels (a main fuel and a pilot fuel) (see figure 1). The Bundrick reference is relied only on its teaching of using acetalene based fuel. It would have been obvious to utilize acetalene in the Dahung engine as suggested by Bundrick since utilizing such fuel would have increased

the output of the engine since acetalene has a high specific energy versus conventional fuel.

Secondly, appellant attacks the Gonzalez reference separately in similar manner as recited above. Appellant argues the the Gonzalez reference is not directed toward homogeneous charge compression ignition engine as claimed instead is directed to spark ignition engine. However, the primary reference, Daung teaches homoeneous charge compression ignition engine (see figure 1). Moreover, the use of double fuel injections are equally germaine to both spark ignition and compression ignition engines. Furthermore, appellant argues that Gonzalez fails to teach the pilot fuel and main fuel to be injected into the same combustion chambers. However, the primary reference (Daung) teaches the pilot fuel and the main fuel to be injected into the same combustion chambers (see figure 1). The Gonzalez reference is relied only for its teaching of concurrent, main and pilot injection timing (see column 2, line 67 to column 3, line 3). Gonzalez teaches the motivation for implementing concurrent or staged injections depending on application parameters (see column 2, line 67 to column 3, line 3).

Appellant's arguments amount to a piecemeal dissection of the individual references; references are evaluated as to what they suggest to one having ordinary skill in the art. In summary, Dahung discloses the claimed invention except for using acetylene-based fuel and concurrent injection. Bundrick suggests the use of acetylene-based fuel and the motivation for doing so is improved engine performance as discussed above.

Gonzalez further teaches concurrent injection wherein the motivation for such injection type is situation specific as discussed above.

Remarks directed to the new issues raised in the reply brief filed 8/21/2006.

Appellant argues on pages 11,12 that the claims specifically recite numerical ranges that are not disclosed in the references. Appellant is correct that the references specifically don't disclose the claimed numerical ranges. However, Dahung in view of Bundrick discloses the claimed invention except for the claimed numerical values that would be obvious for it would have been obvious to one having ordinary skill in the art of engines to optimize the proportions of the fuel based on the loading requirements of the engine since the energy output of the fuel varies with the various fuel compositions. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the claimed numerical values based on the application, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Zelalem Eshete
Examiner
Art Unit 3748



January 30, 2007

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